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Air Quality Monitoring

Fire at Custom Environmental Services

May 5, 2005 Special Report – Emergency Response

Introduction

Alberta Environment conducts mobile air quality surveys each year as part of its air quality monitoring program. These monitoring surveys are unannounced and use the Department's *Mobile Air Monitoring Laboratory* (MAML). The MAML provides a "snapshot" in time and space of the air quality at the location monitored. Pollutants measured by the MAML included ammonia, carbon monoxide, hydrocarbons (methane, total, reactive and polycyclic aromatic), oxides of nitrogen (NO_2, NO and NO_x), ozone, particulate matter (TSP, PM_{10} and $PM_{2.5}$), hydrogen sulphide, total reduced sulphur and sulphur dioxide.

The primary purpose of the MAML is to conduct proactive or scientific air quality surveys across the province of Alberta. At any given time, the MAML can be in an Alberta community that requires specialized and unique monitoring. As it has in the past, the MAML may continue its support role in environmental emergencies such as spills and fires however, it is limited in how quickly it can respond. The MAML is not designed or equipped for emergency response monitoring, however, it can be used in a limited capacity to provide such support during upset conditions.

Alberta Environment is not the first to respond to spill and fire emergencies. Local police, fire and health services are generally the first responders to such incidents. Evacuation or shelter-in-place orders must often be made quickly by local authorities without the benefit of test results from sophisticated air monitoring equipment.

On Thursday May 5, 2005 at approximately 15:50pm, an uncontrolled fire began during routine waste handling activities at Custom Environmental Services Limited (CES); Alberta Environment was requested to provide air monitoring support. The MAML was deployed to southeast Edmonton shortly after Alberta Environment received notification that there was a fire at the CES facility; monitoring began at 16:29pm.

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All of the monitoring locations were offsite and generally downwind from the CES site. Monitoring sites were selected based on wind direction, plume movement and road accessibility. Alberta Environment collected over 5 hours of air quality data. This report presents hydrocarbon, particulate matter, ozone, hydrogen sulphide, total reduced sulphur, sulphur dioxide, nitrogen dioxide, and ammonia monitoring results.

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Data Summary

(1) In typical pro-active surveys, the MAML is stationary for a period of time long enough to compare measured concentrations to 1-hour Alberta Ambient Air Quality Objectives (AAAQOs). During this emergency response event, the lab was generally mobile around industrial parks and residential communities near the CES facility. Concentrations of selected air pollutants measured during the May 5, 2005 CES fire can be found in Table 1. The values presented in Table 1 are overall summary statistics for all 1-minute average concentrations.

Table 1: Summary of MAML Monitoring results for the CES Fire (1-minute averages).

Pollutant	Units	Minimum	Average	Maximum	1-hour AAAQO
Ammonia **(NH_3)**	ppm	bd	0.002	0.054	2.0
Carbon Monoxide **(CO)**	ppm	bd	0.5	2.9	13.0
Nitrogen dioxide **(NO_2)**	ppm	bd	0.019	0.077	0.212
Ozone **(O_3)**	ppm	0.018	0.038	0.051	0.082
Hydrocarbons – Polycyclic Aromatic Hydrocarbons **(PAH)**	ng/m^3	bd	15	277	*NONE*
Particulates – Total Suspended Particulates **(TSP)**	ug/m^3	8	86	1650	*NONE*
Particulates – Particulate Matter <10µm **(PM_{10})**	ug/m^3	7	54	765	*NONE*
Particulates – Particulate Matter <2.5µm **($PM_{2.5}$)**	ug/m^3	2	12	245	*NONE*
Sulphur Compounds - Hydrogen Sulphide **(H_2S)**	ppm	bd	0.001	0.001	0.010
Sulphur Compounds - Total Reduced Sulphur **(TRS)**	ppm	bd	0.001	0.006	*NONE*
Sulphur Dioxide **(SO_2)**	ppm	bd	0.002	0.025	0.172

ppm – parts per million ng/m^3 – nanograms per cubic meter of air bd – below detection limit

Data Summary

(1) In typical pro-active surveys, the MAML is stationary for a period of time long enough to compare measured concentrations to 1-hour Alberta Ambient Air Quality Objectives (AAAQOs). During this emergency response event, the lab was generally mobile around industrial parks and residential communities near the CES facility. Concentrations of selected air pollutants measured during the May 5, 2005 CES fire can be found in Table 1. The values presented in Table 1 are overall summary statistics for all 1-minute average concentrations.

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Nitrogen dioxide **(NO_2)**	ppm	bd	0.019	0.077	0.212
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Hydrocarbons – Polycyclic Aromatic Hydrocarbons **(PAH)**	ng/m^3	bd	15	277	*NONE*
Particulates – Total Suspended Particulates **(TSP)**	ug/m^3	8	86	1650	*NONE*
Particulates – Particulate Matter <10μm **(PM_{10})**	ug/m^3	7	54	765	*NONE*
Particulates – Particulate Matter <2.5μm **($PM_{2.5}$)**	ug/m^3	2	12	245	*NONE*
Sulphur Compounds - Hydrogen Sulphide **(H_2S)**	ppm	bd	0.001	0.001	0.010
Sulphur Compounds - Total Reduced Sulphur **(TRS)**	ppm	bd	0.001	0.006	*NONE*
Sulphur Dioxide **(SO_2)**	ppm	bd	0.002	0.025	0.172

ppm – parts per million ng/m^3 – nanograms per cubic meter of air bd – below detection limit

Monitoring Method and Locations

Alberta Environment used the MAML to monitor pollutant concentrations around the industrial areas and residential communities downwind from the fire. The monitoring sites were selected based on wind direction (See Figure 3), plume movement and road accessibility. MAML monitoring locations are presented in Figure 2 and described in Table 3.

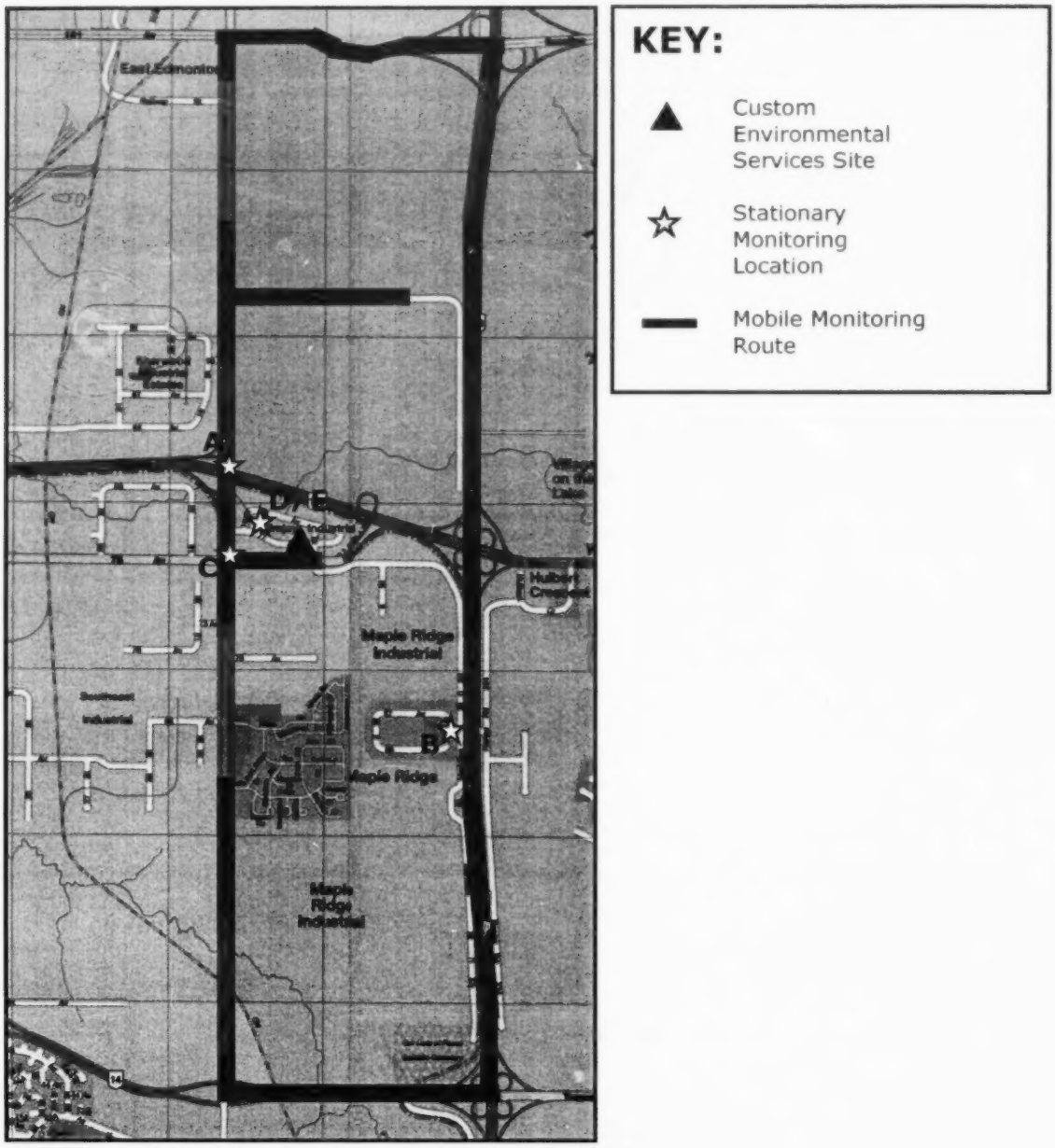

Figure 2: Locations and routes monitored by the MAML.

Adapted from: MapArt Publishing Corporation: Steet Map for Edmonton, Sherwood Park, Fort Saskatchewan

Table 3: Locations monitored by the MAML on May 5, 2005 (Chronological Order).

Dataset Name	Monitoring Location or Route Description	Time	Duration
F	East on 92nd Avenue from 17th Street	16:29 to 16:34 (MOBILE)	5
G	Continue east on 92nd Avenue	16:34 to 16:39 (MOBILE)	5
H	Continue east on 92nd Avenue	16:39 to 16:44 (MOBILE)	5
I	U-turn, west on 92nd Avenue	16:44 to 16:49 (MOBILE)	5
J	Continue west on 92nd Avenue	16:49 to 16:54 (MOBILE)	5
K	South on 17 Street	16:54 to 16:59 (MOBILE)	5
L	Continue South on 17th Street	16:59 to 17:04 (MOBILE)	5
A	Stop at Sherwood Park Freeway and 17th Street	17:04 to 17:45 **(STATIONARY)**	41
M	North on 17th Street	17:45 to 17:50 (MOBILE)	5
N	East on Baseline Road	17:50 to 17:55 (MOBILE)	5
O	South on Highway 216	17:55 to 18:00 (MOBILE)	5
P	Continue South on Highway 216	18:00 to 18:05 (MOBILE)	5
Q	Continue South on Highway 216	18:05 to 18:10 (MOBILE)	5
R	Continue South on Highway 216	18:10 to 18:15 (MOBILE)	5
S	Continue South on Highway 216	18:15 to 18:19 (MOBILE)	5
B	3rd Street and 67th Avenue	18:19 to 18:30 **(STATIONARY)**	9
T	South on Highway 216	18:30 to 18:35 (MOBILE)	5
U	West on Whitemud Drive	18:35 to 18:40 (MOBILE)	5
V	North on 17th Street at Whitemud Drive	18:40 to 18:45 (MOBILE)	5
C	Stop at 17th Street and 76th Avenue	18:46 to 19:59 **(STATIONARY)**	73
D	16th Street and 78th Avenue	20:04 to 21:04 **(STATIONARY)**	60
E	16th Street and 78th Avenue	21:04 to 21:49 **(STATIONARY)**	45

Monitoring Method and Locations

Alberta Environment used the MAML to monitor pollutant concentrations around the industrial areas and residential communities downwind from the fire. The monitoring sites were selected based on wind direction (See Figure 3), plume movement and road accessibility. MAML monitoring locations are presented in Figure 2 and described in Table 3.

Figure 2: **Locations and routes monitored by the MAML.**

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I	U-turn, west on 92nd Avenue	16:44 to 16:49 (MOBILE)	5
J	Continue west on 92nd Avenue	16:49 to 16:54 (MOBILE)	5
K	South on 17 Street	16:54 to 16:59 (MOBILE)	5
L	Continue South on 17th Street	16:59 to 17:04 (MOBILE)	5
A	Stop at Sherwood Park Freeway and 17th Street	17:04 to 17:45 (STATIONARY)	41
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P	Continue South on Highway 216	18:00 to 18:05 (MOBILE)	5
Q	Continue South on Highway 216	18:05 to 18:10 (MOBILE)	5
R	Continue South on Highway 216	18:10 to 18:15 (MOBILE)	5
S	Continue South on Highway 216	18:15 to 18:19 (MOBILE)	5
B	3rd Street and 67th Avenue	18:19 to 18:30 (STATIONARY)	9
T	South on Highway 216	18:30 to 18:35 (MOBILE)	5
U	West on Whitemud Drive	18:35 to 18:40 (MOBILE)	5
V	North on 17th Street at Whitemud Drive	18:40 to 18:45 (MOBILE)	5
C	Stop at 17th Street and 76th Avenue	18:46 to 19:59 (STATIONARY)	73
D	16th Street and 78th Avenue	20:04 to 21:04 (STATIONARY)	60
E	16th Street and 78th Avenue	21:04 to 21:49 (STATIONARY)	45

Wind direction during the CES fire was predominantly from the east northeast. Wind direction and wind speed were measured only while the MAML was stationary.

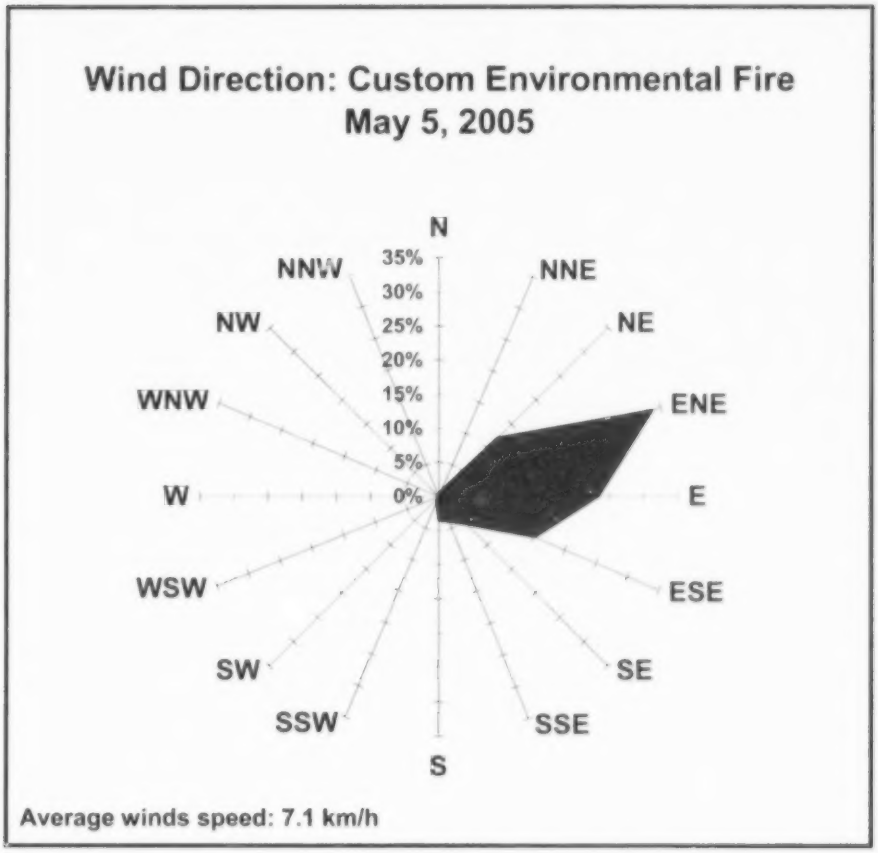

Figure 3: **Wind rose plot for stationary monitoring periods on May 5, 2005.**

Appendix A

Monitoring Data

Table A1 Average of one-minute concentrations measured during the Custom Environmental Services fire.

						Hydrocarbons				Oxides of Nitrogen				Particulates			Sulphur Compounds		
Dataset	Time	Wind Speed	Wind Direction	NH_3	CO	CH_4	RHC	THC	PAH	NO_2	NO	NO_X	O_3	TSP	PM_{10}	$PM_{2.5}$	H_2S	TRS	SO_2
		km/h		ppm	ppm	ppm	ppm	ppm	ng/m^3	ppm	ppm	ppm	ppm	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	ppm	ppm	ppm
F	16:29 to 16:34			0.005	0.8	ND	ND	ND	10.6	0.015	0.004	0.018	0.041	36	26	4	bd	bd	bd
G	16:34 to 16:39			0.005	0.6	ND	ND	ND	6.2	0.001	0.006	0.004	0.043	18	15	3	0.002	bd	bd
H	16:39 to 16:44			bd	0.1	ND	ND	ND	bd	0.006	bd	0.007	0.043	317	194	17	0.002	bd	bd
I	16:44 to 16:49			bd	0.1	ND	ND	ND	4.9	0.002	0.002	0.006	0.045	211	114	10	0.002	bd	bd
J	16:49 to 16:54			0.015	0.2	ND	ND	ND	4.2	0.002	0.010	0.010	0.042	47	31	5	0.002	bd	bd
K	16:54 to 16:59			bd	0.1	ND	ND	ND	12.6	0.013	0.004	0.019	0.040	51	34	5	0.002	bd	bd
L	16:59 to 17:04			bd	0.1	ND	ND	ND	5.9	0.028	0.006	0.035	0.042	41	28	4	0.002	bd	bd
A ☆	17:04 to 17:45	6.1	SE	0.001	0.4	ND	ND	ND	9.6	0.012	0.012	0.022	0.043	210	117	25	0.001	0.001	0.003
M	17:45 to 17:50			bd	0.7	ND	ND	ND	19.9	0.045	0.007	0.051	0.043	115	78	29	0.002	0.001	0.007
N	17:50 to 17:55			bd	2.9	ND	ND	ND	45.4	0.077	0.086	0.149	0.037	98	61	10	0.001	bd	0.001
O	17:55 to 18:00			0.002	0.3	ND	ND	ND	18.8	0.006	0.006	0.013	0.038	36	27	5	bd	bd	0.004
P	18:00 to 18:05			bd	0.8	ND	ND	ND	47.8	0.033	0.018	0.052	0.029	70	43	6	0.001	bd	0.002
Q	18:05 to 18:10			bd	0.3	ND	ND	ND	6.8	0.053	0.026	0.078	0.037	42	27	4	0.001	bd	0.001
R	18:10 to 18:15			0.001	0.3	ND	ND	ND	4.2	0.024	0.003	0.027	0.039	87	52	6	bd	bd	bd
S	18:15 to 18:19			bd	0.7	ND	ND	ND	bd	0.019	0.005	0.026	0.040	110	55	7	0.001	bd	bd
B ☆	18:19 to 18:30	4.9	SE	bd	0.3	ND	ND	ND	bd	0.005	0.002	0.006	0.040	60	35	5	bd	bd	bd
T	18:30 to 18:35			0.003	0.2	ND	ND	ND	3.7	0.003	0.003	0.007	0.037	29	21	4	bd	bd	bd
U	18:35 to 18:40			0.001	0.2	ND	ND	ND	3.2	0.008	0.010	0.018	0.036	16	12	3	bd	bd	bd
V	18:40 to 18:45			0.001	0.2	ND	ND	ND	bd	0.003	0.002	0.006	0.040	35	22	4	bd	bd	bd
C ☆	18:46 to 19:59	10.8	ENE	0.001	1.0	ND	ND	ND	29.4	0.016	0.010	0.025	0.032	100	75	37	0.001	0.002	0.005
D ☆	20:04 to 21:04	7.3	ENE	bd	0.5	ND	ND	ND	23.8	0.024	0.008	0.030	0.022	100	81	47	0.001	0.002	0.007
E ☆	21:04 to 21:49	6.5	E	bd	0.5	ND	ND	ND	16.7	0.024	0.010	0.033	0.021	60	44	16	bd	0.002	0.004

ND – not determined (analyzer not functioning) bd – below detection limit of analyzer ☆ - Stationary data sets

Table A2 Maximum 1-minute concentrations measured during the Custom Environmental Services fire.

Dataset	Time	Wind Speed	Wind Direction			Hydrocarbons				Oxides of Nitrogen				Particulates			Sulphur Compounds		
				NH_3	CO	CH_4	RHC	THC	PAH	NO_2	NO	NO_x	O_3	TSP	PM_{10}	$PM_{2.5}$	H_2S	TRS	SO_2
		km/h		ppm	ppm	ppm	ppm	ppm	ng/m^3	ppm	ppm	ppm	ppm	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	ppm	ppm	ppm
F	16:29 to 16:34			0.018	1.5	ND	ND	ND	37.0	0.031	0.019	0.034	0.044	67	54	9	0.001	bd	0.003
G	16:34 to 16:39			0.012	1.7	ND	ND	ND	25.7	0.004	0.021	0.011	0.046	27	21	4	0.002	bd	bd
H	16:39 to 16:44			bd	0.2	ND	ND	ND	4.5	0.014	0.001	0.017	0.047	1303	794	62	0.003	bd	bd
I	16:44 to 16:49			0.002	0.2	ND	ND	ND	16.9	0.010	0.006	0.018	0.047	756	362	24	0.003	bd	bd
J	16:49 to 16:54			0.042	0.3	ND	ND	ND	10.9	0.010	0.027	0.018	0.047	105	53	7	0.003	bd	bd
K	16:54 to 16:59			bd	0.2	ND	ND	ND	36.0	0.021	0.016	0.039	0.047	83	57	7	0.003	bd	bd
L	16:59 to 17:04			bd	0.2	ND	ND	ND	36.0	0.114	0.017	0.132	0.045	59	43	7	0.003	bd	bd
A ☆	17:04 to 17:45	13.7	SE	0.019	1.8	ND	ND	ND	140.5	0.084	0.081	0.094	0.051	1640	765	165	0.003	0.003	0.010
M	17:45 to 17:50			bd	2.2	ND	ND	ND	48.3	0.339	0.056	0.397	0.048	198	131	60	0.003	0.003	0.010
N	17:50 to 17:55			0.004	7.2	ND	ND	ND	184.0	0.339	0.235	0.397	0.042	216	122	19	0.003	bd	0.005
O	17:55 to 18:00			0.006	0.7	ND	ND	ND	43.5	0.012	0.018	0.021	0.042	81	47	6	0.001	bd	0.012
P	18:00 to 18:05			bd	1.5	ND	ND	ND	117.4	0.054	0.042	0.096	0.040	126	70	9	0.002	bd	0.003
Q	18:05 to 18:10			bd	0.7	ND	ND	ND	13.4	0.113	0.044	0.143	0.041	58	36	5	0.001	0.001	0.002
R	18:10 to 18:15			0.004	0.4	ND	ND	ND	10.3	0.100	0.011	0.104	0.041	166	101	10	0.001	0.001	0.002
S	18:15 to 18:19			bd	1.7	ND	ND	ND	7.6	0.100	0.009	0.104	0.043	211	113	10	0.001	bd	bd
B ☆	18:19 to 18:30	6.8	SE	0.001	0.4	ND	ND	ND	bd	0.008	0.007	0.012	0.043	94	50	6	0.001	bd	0.001
T	18:30 to 18:35			0.008	0.5	ND	ND	ND	11.9	0.004	0.007	0.011	0.040	33	26	4	0.001	bd	bd
U	18:35 to 18:40			0.007	0.5	ND	ND	ND	11.9	0.016	0.016	0.030	0.040	23	18	3	bd	bd	bd
V	18:40 to 18:45			0.002	0.5	ND	ND	ND	4.9	0.014	0.016	0.030	0.043	56	29	5	bd	bd	bd
C ☆	18:46 to 19:59	16.4	ENE	0.054	2.4	ND	ND	ND	277.3	0.119	0.068	0.124	0.045	377	333	245	0.004	0.006	0.025
D ☆	20:04 to 21:04	12.9	ENE	bd	1.2	ND	ND	ND	63.4	0.037	0.018	0.052	0.033	249	191	110	0.002	0.004	0.015
E ☆	21:04 to 21:49	10.9	E	bd	1.0	ND	ND	ND	83.6	0.062	0.072	0.118	0.032	178	148	76	0.003	0.004	0.015

ND – not determined (analyzer not functioning) bd – below detection limit of analyzer ☆ - stationary data sets

Table A1 Average of one-minute concentrations measured during the Custom Environmental Services fire.

						Hydrocarbons				Oxides of Nitrogen				Particulates			Sulphur Compounds		
Dataset	Time	Wind Speed	Wind Direction	NH_3	CO	CH_4	RHC	THC	PAH	NO_2	NO	NO_x	O_3	TSP	PM_{10}	$PM_{2.5}$	H_2S	TRS	SO_2
		km/h		ppm	ppm	ppm	ppm	ppm	ng/m^3	ppm	ppm	ppm	ppm	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	ppm	ppm	ppm
F	16:29 to 16:34			0.005	0.8	ND	ND	ND	10.6	0.015	0.004	0.018	0.041	36	26	4	bd	bd	bd
G	16:34 to 16:39			0.005	0.6	ND	ND	ND	6.2	0.001	0.006	0.004	0.043	18	15	3	0.002	bd	bd
H	16:39 to 16:44			bd	0.1	ND	ND	ND	bd	0.006	bd	0.007	0.043	317	194	17	0.002	bd	bd
I	16:44 to 16:49			bd	0.1	ND	ND	ND	4.9	0.002	0.002	0.006	0.045	211	114	10	0.002	bd	bd
J	16:49 to 16:54			0.015	0.2	ND	ND	ND	4.2	0.002	0.010	0.010	0.042	47	31	5	0.002	bd	bd
K	16:54 to 16:59			bd	0.1	ND	ND	ND	12.6	0.013	0.004	0.019	0.040	51	34	5	0.002	bd	bd
L	16:59 to 17:04			bd	0.1	ND	ND	ND	5.9	0.028	0.006	0.035	0.042	41	28	4	0.002	bd	bd
A ☆	17:04 to 17:45	6.1	SE	0.001	0.4	ND	ND	ND	9.6	0.012	0.012	0.022	0.043	210	117	25	0.001	0.001	0.003
M	17:45 to 17:50			bd	0.7	ND	ND	ND	19.9	0.045	0.007	0.051	0.043	115	78	29	0.002	0.001	0.007
N	17:50 to 17:55			bd	2.9	ND	ND	ND	45.4	0.077	0.086	0.149	0.037	98	61	10	0.001	bd	0.001
O	17:55 to 18:00			0.002	0.3	ND	ND	ND	18.8	0.006	0.006	0.013	0.038	36	27	5	bd	bd	0.004
P	18:00 to 18:05			bd	0.8	ND	ND	ND	47.8	0.033	0.018	0.052	0.029	70	43	6	0.001	bd	0.002
Q	18:05 to 18:10			bd	0.3	ND	ND	ND	6.8	0.053	0.026	0.078	0.037	42	27	4	0.001	bd	0.001
R	18:10 to 18:15			0.001	0.3	ND	ND	ND	4.2	0.024	0.003	0.027	0.039	87	52	6	bd	bd	bd
S	18:15 to 18:19			bd	0.7	ND	ND	ND	bd	0.019	0.005	0.026	0.040	110	55	7	0.001	bd	bd
B ☆	18:19 to 18:30	4.9	SE	bd	0.3	ND	ND	ND	bd	0.005	0.002	0.006	0.040	60	35	5	bd	bd	bd
T	18:30 to 18:35			0.003	0.2	ND	ND	ND	3.7	0.003	0.003	0.007	0.037	29	21	4	bd	bd	bd
U	18:35 to 18:40			0.001	0.2	ND	ND	ND	3.2	0.008	0.010	0.018	0.036	16	12	3	bd	bd	bd
V	18:40 to 18:45			0.001	0.2	ND	ND	ND	bd	0.003	0.002	0.006	0.040	35	22	4	bd	bd	bd
C ☆	18:46 to 19:59	10.8	ENE	0.001	1.0	ND	ND	ND	29.4	0.016	0.010	0.025	0.032	100	75	37	0.001	0.002	0.005
D ☆	20:04 to 21:04	7.3	ENE	bd	0.5	ND	ND	ND	23.8	0.024	0.008	0.030	0.022	100	81	47	0.001	0.002	0.007
E ☆	21:04 to 21:49	6.5	E	bd	0.5	ND	ND	ND	16.7	0.024	0.010	0.033	0.021	60	44	16	bd	0.002	0.004

ND – not determined (analyzer not functioning) bd – below detection limit of analyzer ☆ - Stationary data sets

Table A2 Maximum 1-minute concentrations measured during the Custom Environmental Services fire.

						Hydrocarbons				Oxides of Nitrogen				Particulates			Sulphur Compounds		
Dataset	Time	Wind Speed	Wind Direction	NH_3	CO	CH_4	RHC	THC	PAH	NO_2	NO	NO_X	O_3	TSP	PM_{10}	$PM_{2.5}$	H_2S	TRS	SO_2
		km/h		ppm	ppm	ppm	ppm	ppm	ng/m³	ppm	ppm	ppm	ppm	µg/m³	µg/m³	µg/m³	ppm	ppm	ppm
F	16:29 to 16:34			0.018	1.5	ND	ND	ND	37.0	0.031	0.019	0.034	0.044	67	54	9	0.001	bd	0.003
G	16:34 to 16:39			0.012	1.7	ND	ND	ND	25.7	0.004	0.021	0.011	0.046	27	21	4	0.002	bd	bd
H	16:39 to 16:44			bd	0.2	ND	ND	ND	4.5	0.014	0.001	0.017	0.047	1303	794	62	0.003	bd	bd
I	16:44 to 16:49			0.002	0.2	ND	ND	ND	16.9	0.010	0.006	0.018	0.047	756	362	24	0.003	bd	bd
J	16:49 to 16:54			0.042	0.3	ND	ND	ND	10.9	0.010	0.027	0.018	0.047	105	53	7	0.003	bd	bd
K	16:54 to 16:59			bd	0.2	ND	ND	ND	36.0	0.021	0.016	0.039	0.047	83	57	7	0.003	bd	bd
L	16:59 to 17:04			bd	0.2	ND	ND	ND	36.0	0.114	0.017	0.132	0.045	59	43	7	0.003	bd	bd
A ☆	17:04 to 17:45	13.7	SE	0.019	1.8	ND	ND	ND	140.5	0.084	0.081	0.094	0.051	1640	765	165	0.003	0.003	0.010
M	17:45 to 17:50			bd	2.2	ND	ND	ND	48.3	0.339	0.056	0.397	0.048	198	131	60	0.003	0.003	0.010
N	17:50 to 17:55			0.004	7.2	ND	ND	ND	184.0	0.339	0.235	0.397	0.042	216	122	19	0.003	bd	0.005
O	17:55 to 18:00			0.006	0.7	ND	ND	ND	43.5	0.012	0.018	0.021	0.042	81	47	6	0.001	bd	0.012
P	18:00 to 18:05			bd	1.5	ND	ND	ND	117.4	0.054	0.042	0.096	0.040	126	70	9	0.002	bd	0.003
Q	18:05 to 18:10			bd	0.7	ND	ND	ND	13.4	0.113	0.044	0.143	0.041	58	36	5	0.001	0.001	0.002
R	18:10 to 18:15			0.004	0.4	ND	ND	ND	10.3	0.100	0.011	0.104	0.041	166	101	10	0.001	0.001	0.002
S	18:15 to 18:19			bd	1.7	ND	ND	ND	7.6	0.100	0.009	0.104	0.043	211	113	10	0.001	bd	bd
B ☆	18:19 to 18:30	6.8	SE	0.001	0.4	ND	ND	ND	bd	0.008	0.007	0.012	0.043	94	50	6	0.001	bd	0.001
T	18:30 to 18:35			0.008	0.5	ND	ND	ND	11.9	0.004	0.007	0.011	0.040	33	26	4	0.001	bd	bd
U	18:35 to 18:40			0.007	0.5	ND	ND	ND	11.9	0.016	0.016	0.030	0.040	23	18	3	bd	bd	bd
V	18:40 to 18:45			0.002	0.5	ND	ND	ND	4.9	0.014	0.016	0.030	0.043	56	29	5	bd	bd	bd
C ☆	18:46 to 19:59	16.4	ENE	0.054	2.4	ND	ND	ND	277.3	0.119	0.068	0.124	0.045	377	333	245	0.004	0.006	0.025
D ☆	20:04 to 21:04	12.9	ENE	bd	1.2	ND	ND	ND	63.4	0.037	0.018	0.052	0.033	249	191	110	0.002	0.004	0.015
E ☆	21:04 to 21:49	10.9	E	bd	1.0	ND	ND	ND	83.6	0.062	0.072	0.118	0.032	178	148	76	0.003	0.004	0.015

ND – not determined (analyzer not functioning) bd – below detection limit of analyzer ☆ – stationary data sets